

# Operating Instructions for the LP 20 Lightpen

## Introduction

The LP 20 Lightpen is a communication peripheral for the VZ-200 and VZ-300 computers. The information exchange takes place via the screen of the monitor or television set.

## Applications include:-

- \* Menu Techniques
- \* Utilities Management
- \* Graphics Design
- \* Data Input and Output

and many more.

## Installation

1. Turn off the computer.
2. Remove the "PERIPHERAL" cover from the rear of the computer.
3. Plug the Lightpen Interface Module into the peripheral socket slowly and smoothly. Check to ensure that the Module is fully inserted and firmly attached.
4. Turn on the power to the computer. Check that the computer operates as before.

NOTE: If the TV screen does not display the "READY" message, turn off the power, remove the module, and reinsert as before.

## Operation

The first requirement for using the Lightpen is an understanding of how the accompanying program operates.

### To operate, follow these steps:-

- Take the Lightpen in your hand.
- With the rounded end in the desired place make contact with the screen. The Lightpen should be touching the screen at right angles.
- With correct placement a bright blue line should immediately appear on the screen directly under the Lightpen and it should produce a reaction from the program.  
(The accompanying demonstration program produces a beep.)

## Possible Errors and Adjustments

The faultless functioning of the Lightpen is also dependent on the optimum brightness adjustment of the TV screen.

- If Lightpen contact on the screen only produces multiple flashes without a positive reaction from the program, then you should make the TV a little brighter.
- If a blue line appears but you still get no result you should try making the TV a little darker.
- If the program always puts the dot to the right of the Lightpen, make the TV a little brighter.
- If the program always puts the dot to the left of the Lightpen, make the TV a little darker.
- If there is still no reaction after all this, you should suspect that the fault lies in your own program.

## Programming

A prerequisite for the use of the Lightpen in a program is the availability of the necessary driver software. This is not included as a standard part of the ROM.

At the beginning of the enclosed cassette you will find a small Machine Code program that implements a supplementary BASIC-Command (LPEN).

This program can be loaded into the computer using CLOAD or CRUN. It automatically occupies about 970 Bytes in high memory. The only requirement is a minimum memory expansion up to BFFF hex, ie. either an unexpanded VZ-200 or a VZ-300.

If the program loads correctly the "READY" message will again appear and you will be able to begin normal program input from the keyboard or tape.

The routine can be entered directly from BASIC.

**Command Syntax:** (BASIC)

LPEN (X,Y) or LPEN (X,Y,A)

"X" and "Y" are numeric variables, which will contain the screen coordinates. In addition the parameter "A" is also a numeric variable, which will contain the relative screen address.

The values of X,Y and A are dependent on the screen mode.

MODE (0) = Text Mode

X = 0 - 31      Y = 0 - 15      A = 0 - 511

MODE (1) = Graphics Mode

X = 0 - 127      Y = 0 - 63      A = 0 - 2047

**Calling from a Machine Code Program:**

The LPEN-Routine can also be used by an Assembler or Machine Code program. You can call the routine with the command.

CALL xx4Bh

Instead of "xx" substitute the high byte of the upper limit of memory.

The coordinate results will be contained in memory locations:-

xF8E = X-Value

xF93 = Y-Value

As well, the relative screen address (A) is determined by whether the location xF99 contains a "1" or not.

If it does, the address will be contained in xF99 / xF9A hex.

## Warning

When programming in Machine Code be careful that you do not overwrite the LPEN-Routine. In contrast, in BASIC the top of memory pointers have been set and overwriting cannot occur.

## Reading

After every call you should test the parameters that have been read.

If the reading was unsuccessful (e.g. the Lightpen wasn't in contact with the screen), then the X- and Y- parameters will contain the value 255 and the A- parameter will contain the value "FFFF".

Naturally during a program you will not know beforehand the exact moment the Lightpen will make contact with the screen, so you should test for this in a loop.

An example in BASIC:

```
10 LPEN (X,Y)
20 IF X=255 THEN 10
30
```

## Demonstration Programs

On the accompanying cassette you will find after the LPEN-Implementation Routine a series of demonstration programs for the Lightpen:

- Drawing on the screen
- Moving shapes
- Writing without a keyboard
- A BASIC Quiz

After you have executed the LPEN-Command program, load the first demonstration program with "CRUN", to get ideas and tips on the possible uses of the Lightpen.

You will be automatically led through the programs one after the other.

Look closely at the logic of each program (DEMO-3 to DEMO-6) for anything you can learn about the techniques used.

In conclusion here is a short sample program:

```
10 MODE(1): CLS: COLOR2
20 LPEN (A,B,C): IF A=255 THEN 20
30 SOUND 31,1: PRINT@C," ";
40 GOTO 10
```

From the start every successful contact with the Lightpen will place a yellow square on the screen.